

1969

OPERATING
SUMMARY

KITCHENER

**water pollution
control plant**

TD
227
K57
W38
1969
MOE
c.1
a aa

ARY COPY

JN 26 1970

ONTARIO WATER
RESOURCES COMMISSION

ONTARIO WATER RESOURCES COMMISSION

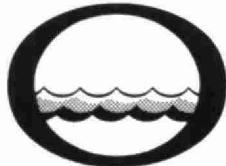
Division of Plant Operations

Copyright Provisions and Restrictions on Copying:

This Ontario Ministry of the Environment work is protected by Crown copyright (unless otherwise indicated), which is held by the Queen's Printer for Ontario. It may be reproduced for non-commercial purposes if credit is given and Crown copyright is acknowledged.

It may not be reproduced, in all or in part, for any commercial purpose except under a licence from the Queen's Printer for Ontario.

For information on reproducing Government of Ontario works, please contact ServiceOntario Publications at copyright@ontario.ca



Water management in Ontario

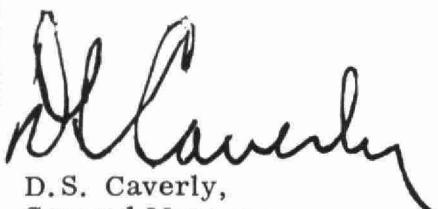
Ontario
Water Resources
Commission

135 St.Clair Ave.W.
Toronto 195
Ontario

The operating efficiency and financial status of the water pollution control facilities operated for you in 1969 are presented in the following pages.

The regional operations engineer's comments and the statistical data will assist you in gauging the plant's level of performance. A new flow chart and up-to-date design data are also provided.

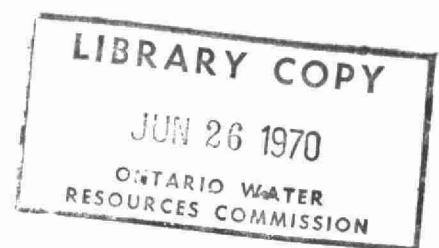
Various divisions and sections within the Commission have co-operated in providing what we trust is an accurate and concise annual operating summary.



D. S. Caverly,
General Manager.



D. A. McTavish, P. Eng.,
Director,
Division of Plant Operations.



CONTENTS

Title page.	1
Flow diagram	2
Design data	3
'69 Review	4
Project costs	6
Process data.	10

TD
227
K57
W38
1969
MOE

atht



Environment Ontario

Laboratory Library

125 Resources Rd.

Etobicoke, Ontario M9P 3V6
Canada

ONTARIO WATER RESOURCES COMMISSION

CHAIRMAN
D. J. Collins

VICE-CHAIRMAN
J. H. H. Root, M. P. P.

COMMISSIONERS
H. E. Brown
D. A. Moodie
L. E. Venchiarutti

GENERAL MANAGER
D. S. Caverly

ASSISTANT GENERAL MANAGERS
L. E. Owers
K. H. Sharpe
F. A. Voegle
A. K. Watt

COMMISSION SECRETARY
W. S. MacDonnell

DIVISION OF PLANT OPERATIONS

Director
D. A. McTavish

Assistant Director
C. W. Perry

Regional Supervisor
A. C. Beattie

Operations Engineer
B. W. Hansler

135 St. Clair Avenue West
Toronto 7

KITCHENER
water pollution control plant

operated for

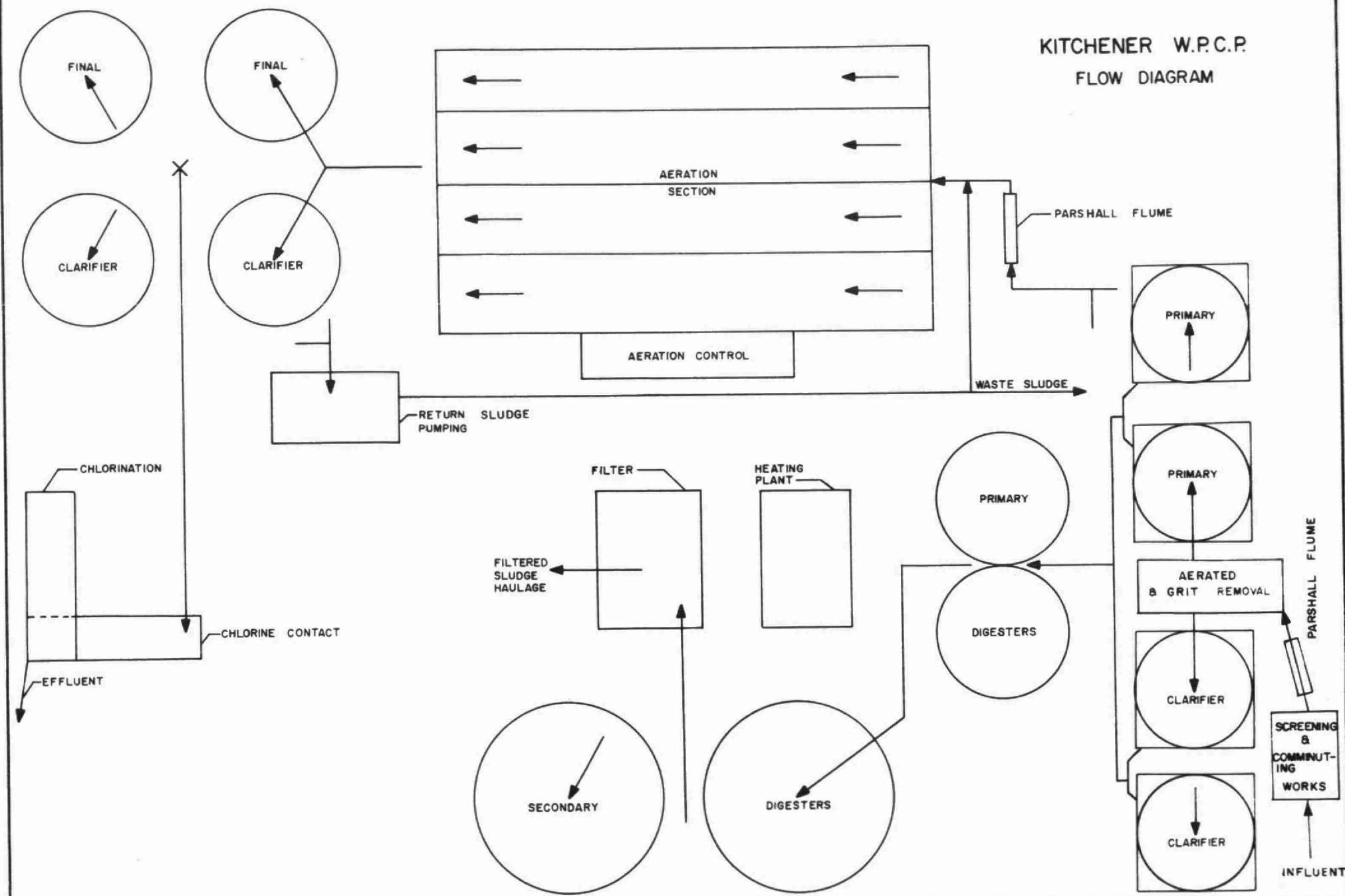
THE CITY OF KITCHENER

by the

ONTARIO WATER RESOURCES COMMISSION

1969 ANNUAL OPERATING SUMMARY

KITCHENER W.P.C.P.
FLOW DIAGRAM



DESIGN DATA

PROJECT NO.	2-0019-58	TREATMENT	Activated Sludge
DESIGN FLOW	11.0 mgd (Prim) 13.5 mgd (Sec)	DESIGN POPULATION	100,000
BOD - Raw Sewage - Removal	300 mg/l 95%	SS - Raw Sewage - Removal	450 mg/l 95%

PRIMARY TREATMENT

Screening

- Manually cleaned bar screen with 4" spacing

Comminution

- One Worthington comminutor

Grit Removal

Type: Aerated; grit removed by air lift
 Size: Two 11' x 10' x 10.5' deep
 (13,700 gal)
 Retention: 1.7 min

Air Supply

- Two Sutorbilt blowers

Primary Sedimentation

Type: Dorr
 Size: Four 60' x 60' x 11' 8" swd (1.01 mil gal)
 Retention: 2.2 hours
 Loading: Surface, 765 gal/ft²/day
 Weir, 26,200 gal/ft/day

SECONDARY TREATMENT

Aeration Tanks

Type: Mechanical aeration, serpentine flow (14 cells/tank)
 Size: Four 210' x 60' x 13' 3" (680,000 cu ft or 4.2 mil gal)
 Retention: 7.5 hours

Aerators

Type: Ames Crosta (56)

Secondary Sedimentation

Type: Dorr
 Size: Four 80' dia x 10' swd (1.35 mil gal)
 Retention: 2.4 hours
 Loading: Surface, 672 gal/ft²/day
 Weir, 13,400 gal/ft/day

CHLORINATION

Type: BIF with evaporator
 Size: One 2000 lb/day
 One 600 lb/day

Chlorine Contact Chamber

Size: (141,000 gal)
 Retention: 15 min

OUTFALL

- to Grand River

SLUDGE HANDLING

Digestion System - Two-stage

Primary --

Type: Dorr, single mixer
 Size: Two 65' dia x 22' swd (144,000 cu ft or 0.90 mil gal)
 Loading: 1.08 lb/cu ft/day

Secondary --

Type: Dorr, floating cover
 Size: Two 100' dia x 29' swd (400,000 cu ft or 2.5 mil gal)
 Total Loading: 0.29 lb/cu ft/mo

Vacuum Filter

Type: Komline - Sanderson
 Size: One 500 sq ft

'69 REVIEW

GENERAL

In 1969, the Kitchener water pollution control plant treated a total of 3,887.8 million gallons at an operating cost of \$275,557.76. The operating cost per million gallons was \$70.88, and the cost per pound of BOD removed was three cents.

The vacuum filter continued to be inoperative during 1969. The cost of operation made it uneconomical to continue its use.

Under the supervision of head office engineers, the plant staff continued to operate a clean, attractive and efficient plant for the City of Kitchener.

PLANT FLOWS and CHLORINATION

In 1969 the average daily flow was 10.7 mil. gal. This represents an increase of 6.9% as compared to the average daily flow in 1968 of 9.96 mil. gal. The aeration section design flow of 13.5 mgd and the primary section design flow of 11.5 mgd were exceeded 8% and 26% of the time respectively.

An average chlorine dosage rate of 4.7 mg/l was required to maintain an average chlorine residual of 0.5 mg/l in the final effluent.

PLANT EFFICIENCY

The average raw sewage BOD of 254 mg/l was 15% less than the design value of 300 mg/l. The raw sewage design value was exceeded 20% of the time. The OWRC BOD effluent objective is 15 mg/l and was exceeded 55% of the time. The average BOD removal efficiency was 92% resulting in an average effluent BOD of 20 mg/l.

The average raw sewage suspended solids concentration of 293 mg/l re-

presents 65% of the design value of 450 mg/l. The raw sewage design value was exceeded only 3% of the time. The average suspended solids removal efficiency of 94% was excellent resulting in an average effluent suspended solids of 19 mg/l. The OWRC effluent suspended solids objective is 15 mg/l and was exceeded 55% of the time.

A total of 4,620 tons of BOD and 5,420 tons of suspended solids were removed in 1969.

The average primary effluent BOD and suspended solids concentrations were 182 mg/l and 160 mg/l respectively. The primary clarifier average BOD and suspended solids reduction efficiencies were 29.5% and 45.5% respectively.

The average MLSS concentrations of 2,570 mg/l and F/M ratio of 19 are within the accepted limits of good aeration tank operation.

A decrease in organic loading can be attributed to the City of Kitchener's industrial waste control program, and particularly to the pretreatment works installed by the Schneider's meat packing plant.

SLUDGE DIGESTION and DISPOSAL

An average of 1.40 mil. gal. of sludge was pumped to the primary digesters each month. The raw sludge averaged 6.0% total solids, of which 70% was volatile matter.

Digested sludge from the secondary digester averaged 3.6% total solids of which 55% was volatile matter.

The average reduction in volatile matter was 47% which compares favourably with existing comparative criteria.

CONCLUSIONS

Average BOD and suspended solids reductions of 92 percent and 90 percent respectively indicated that the plant was operated very well for the City of Kitchener.

Plans to expand the plant should begin in 1970.

PROJECT COSTS

STAGE 1

NET CAPITAL COST (Final)	
Long Term Debt to OWRC	\$ <u>1,312,746.07</u>
Debt Retirement Balance at Credit	
(Sinking Fund) December 31, 1969	\$ <u>608,582.53</u>
Net Operating	\$ 275,557.76
Debt Retirement	47,626.00
Reserve	9,262.63
Interest Charged	<u>73,493.90</u>
TOTAL	\$ <u>405,940.29</u>

RESERVE ACCOUNT

Balance @ January 1, 1969	\$ 100,179.34
Deposited by Municipality	9,262.63
Interest Earned	<u>5,825.86</u>
	\$ 115,267.83
Less Expenditures	<u>3,273.87</u>
Balance @ December 31, 1969	\$ <u>111,993.96</u>

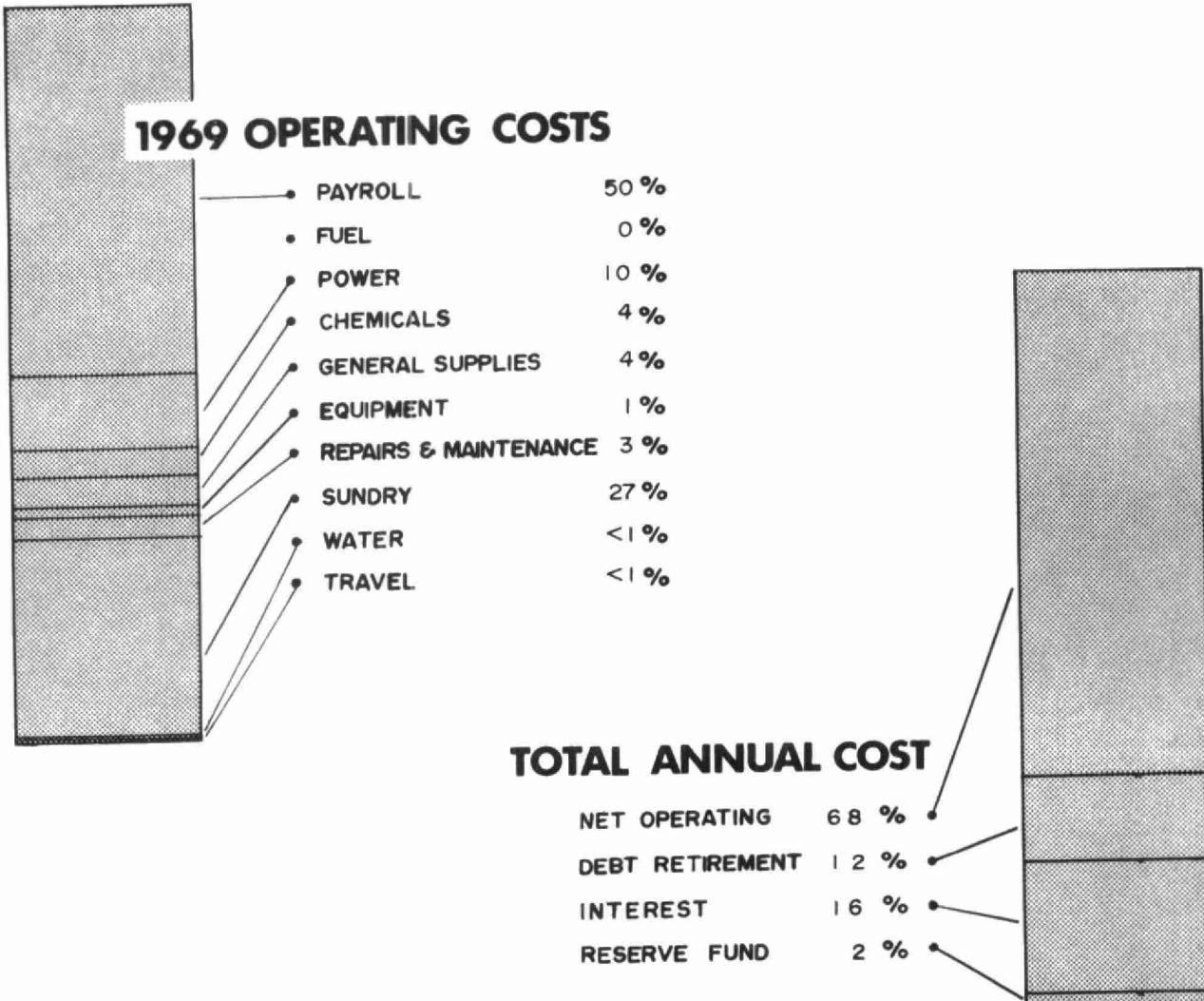
STAGE 2

NET CAPITAL COST (Final)	\$ 1,488,607.70
DEDUCT - Portion financed by CMHC/MDLB (Final)	<u>1,016,967.77</u>
Long Term Debt to OWRC	\$ <u>471,639.93</u>
Debt Retirement Balance at Credit (Sinking Fund) December 31, 1969	\$ <u>138,572.59</u>
Net Operating Debt Retirement Reserve Interest Charged	\$ <u>17,111.00</u> <u>8,975.24</u> <u>26,404.70</u>
TOTAL	\$ <u>52,490.94</u>

RESERVE ACCOUNT

Balance @ January 1, 1969	\$ 40,849.03
Deposited by Municipality	8,975.24
Interest Earned	<u>2,518.50</u>
	\$ 52,342.77
Less Expenditures	<u>—</u>
Balance @ December 1, 1969	\$ <u>52,342.77</u>

1969 OPERATING COSTS



Yearly Operating Costs

YEAR	MILLION GALLONS TREATED	TOTAL OPERATING COSTS	COST PER MILLION GAL	COST PER LB OF BOD REMOVED
1965	3328.1	\$225,144.00	\$67.65	2.0 cents
1966	3457.8	279,143.00	80.73	3.6 cents
1967	3843.0	297,754.00	77.48	3.5 cents
1968	3648.0	291,978.36	80.04	2.8 cents
1969	3887.8	275,557.76	70.88	3.0 cents

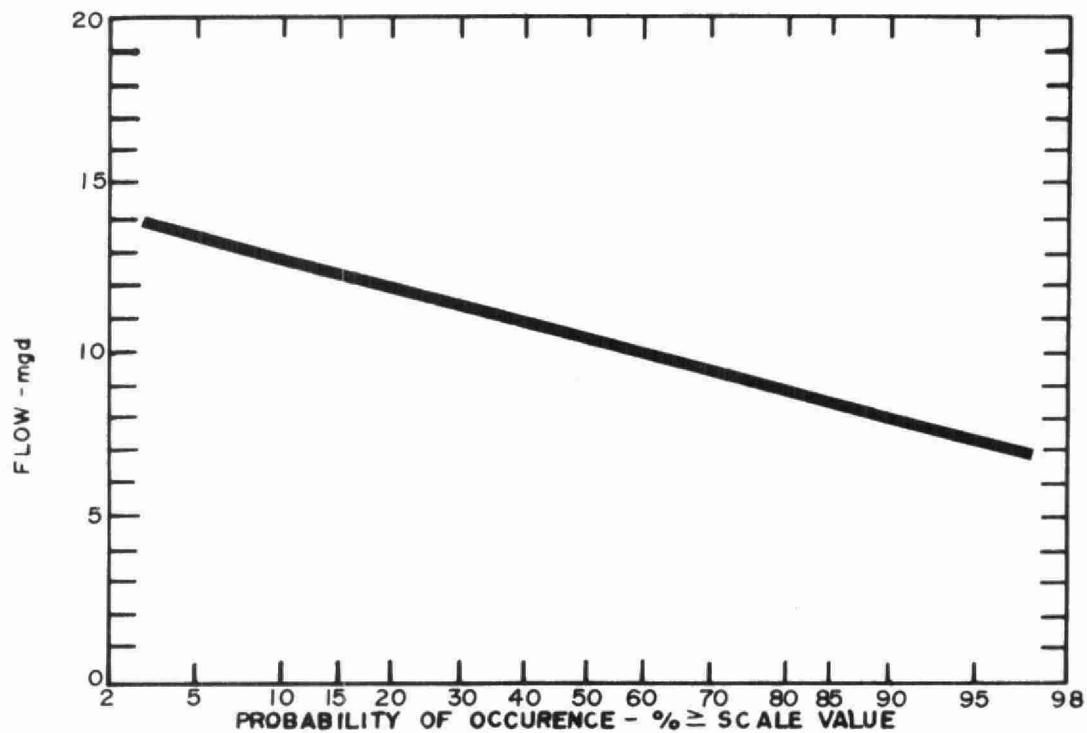
Monthly Operating Costs

MONTH	TOTAL EXPENDITURE	PAYROLL	CASUAL PAYROLL	FUEL	POWER	CHEMICALS	GENERAL SUPPLIES	EQUIPMENT	REPAIRS and MAINTENANCE	SUNDY *	WATER	TRAVEL
JAN	22211.22	14962.73	37.82	-	2709.14	-	218.68	-	440.01	3842.84	-	-
FEB	17082.62	9599.42	-	-	2770.15	-	142.83	347.20	592.55	3566.41	-	64.06
MAR	23162.16	9532.01	-	-	2749.72	2131.50	719.26	(13.49)	529.84	7513.32	-	-
APR	23003.38	9890.43	-	-	2542.69	2131.50	618.35	-	672.95	7147.46	-	-
MAY	37151.14	10681.72	352.02	-	2520.14	-	456.68	1851.21	1460.85	19728.53	75.24	24.75
JUNE	23614.32	10155.43	627.49	-	2386.49	1866.90	175.83	274.63	1021.88	6926.31	-	178.36
JULY	20266.33	10270.49	971.46	-	2420.21	1866.90	532.83	525.03	870.93	2738.44	-	69.04
AUG	23210.11	15326.71	1552.96	-	2368.36	-	492.49	60.48	292.53	3094.08	-	22.50
SEPT	20160.61	10450.69	566.80	-	2630.92	1392.68	493.99	-	494.08	4011.06	120.39	-
OCT	23690.21	10230.48	280.53	-	2368.27	933.45	7440.87	66.04	375.90	1935.89	-	58.78
NOV	16696.72	10205.22	-	-	2769.30	1866.90	276.34	177.56	115.14	1227.91	-	58.35
DEC	25308.94	9898.93	-	-	507.42	-	753.84	572.59	1078.06	12193.67	106.13	198.30
TOTAL	275557.76	131204.26	4389.08	-	28742.81	12189.83	12321.99	3862.25	7944.72	73926.92	301.76	674.14

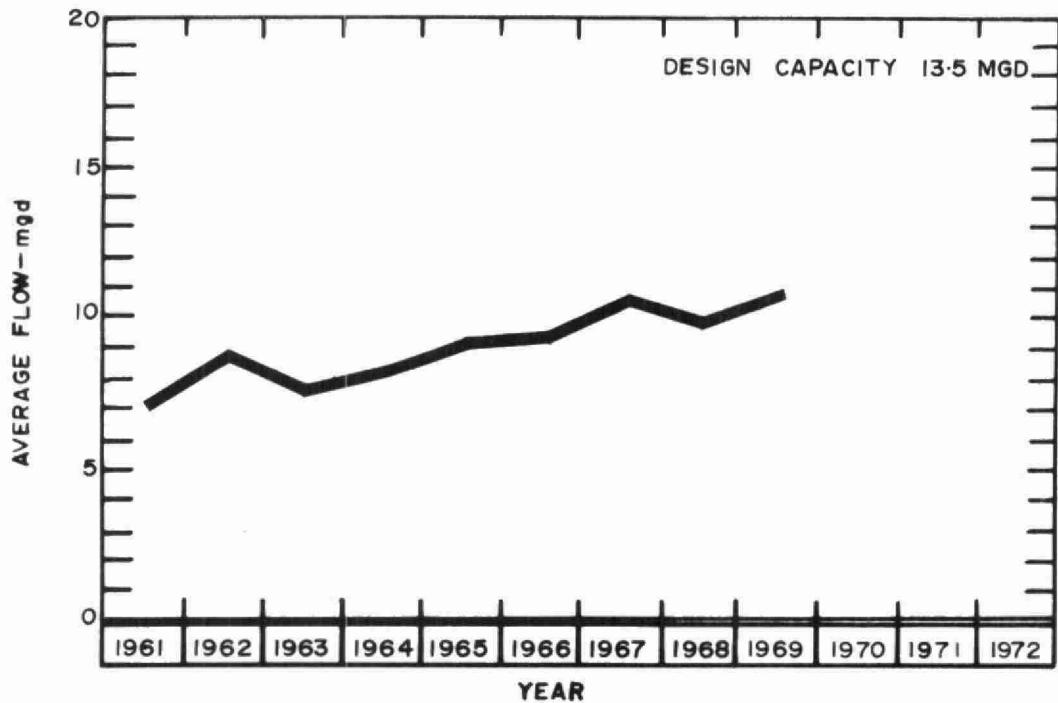
BRACKETS INDICATE CREDIT

* SUNDY INCLUDES SLUDGE HAULAGE COSTS WHICH WERE \$45676.00

PROCESS DATA

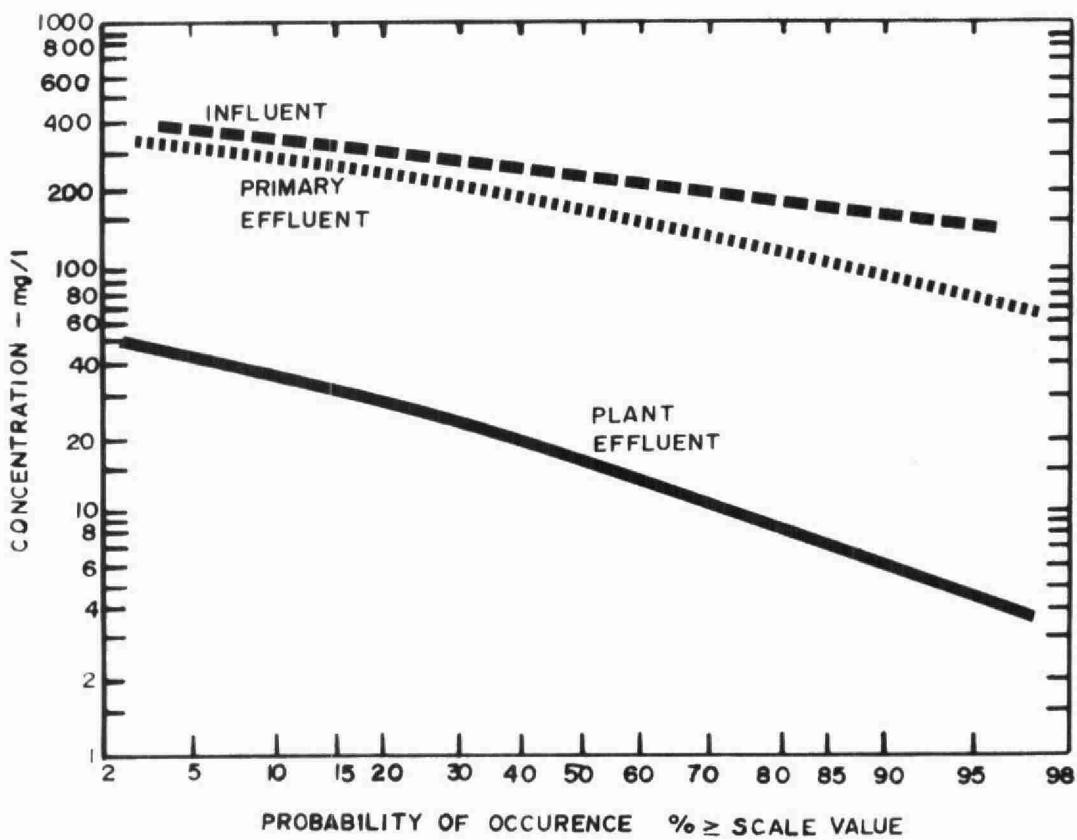


FLows

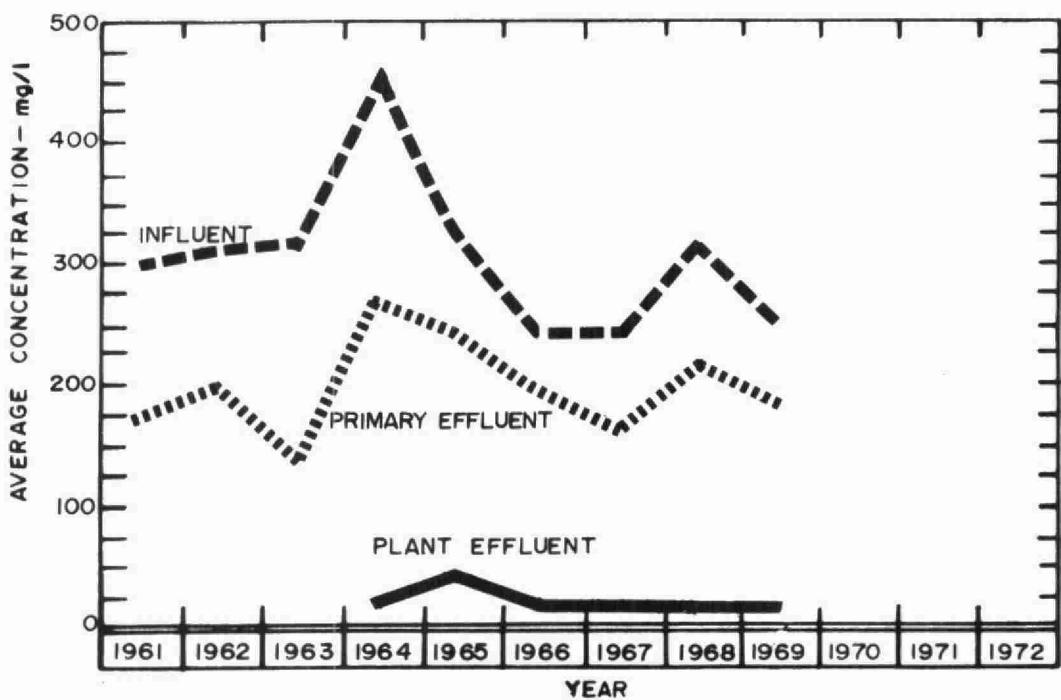


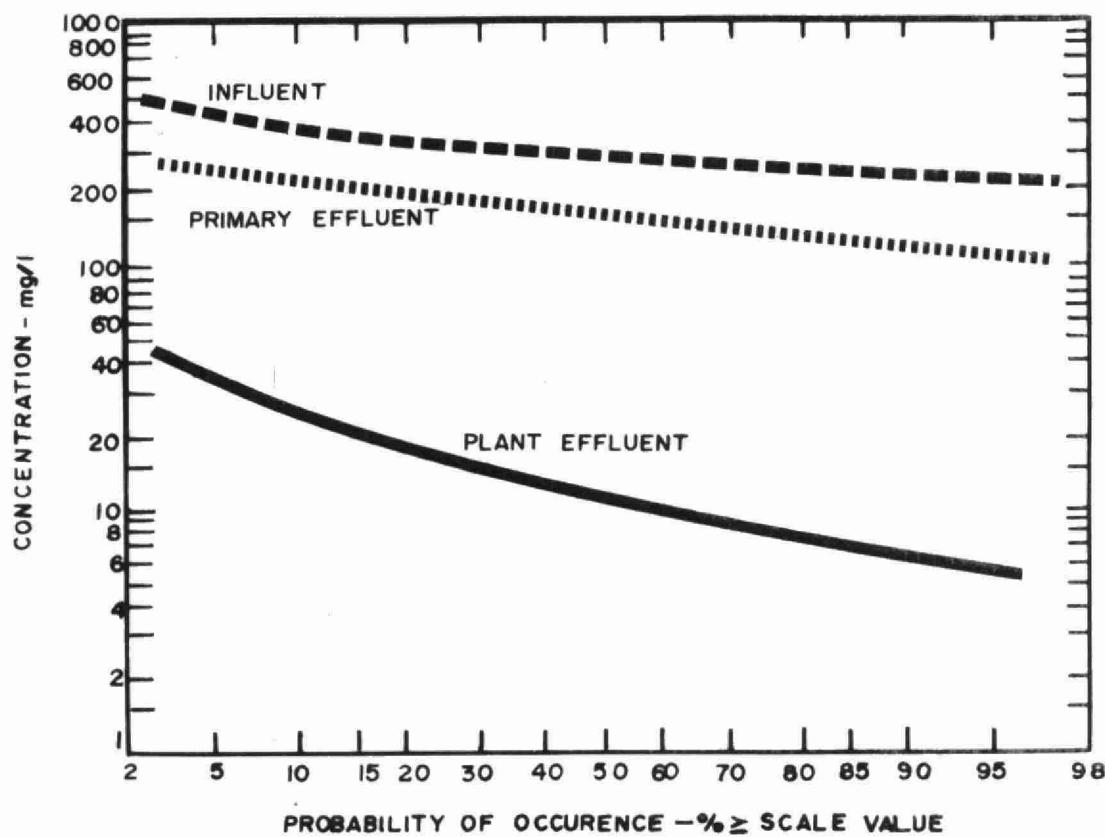
PLANT FLOWS and CHLORINATION

MONTH	TOTAL FLOW mil gal	AVERAGE DAILY FLOW mil gal	MAXIMUM DAILY FLOW mil gal	MINIMUM DAILY FLOW mil gal	CHLORINE USED 10^3 pounds	DOSAGE mg/l
JAN	327.3	10.5	20.4	6.4	16.6	5.1
FEB	324.2	11.5	13.6	8.6	15.3	4.7
MAR	341.8	11.0	15.1	7.2	17.6	5.2
APR	373.3	12.4	16.1	9.7	16.0	4.2
MAY	375.6	12.1	14.1	9.1	15.4	4.1
JUNE	326.8	10.9	12.4	9.7	12.9	3.9
JULY	319.3	10.3	13.8	6.5	13.1	4.1
AUG	289.4	9.3	11.5	6.5	15.1	5.2
SEPT	285.0	9.5	12.0	6.6	15.2	5.5
OCT	288.3	9.3	11.5	6.1	13.5	4.7
NOV	330.2	11.0	15.9	8.2	14.3	4.3
DEC	306.6	9.9	11.7	7.4	16.9	6.8
TOTAL	3887.8	-	-	-	181.9	-
AVERAGE	-	10.7	-	-	15.1	4.7

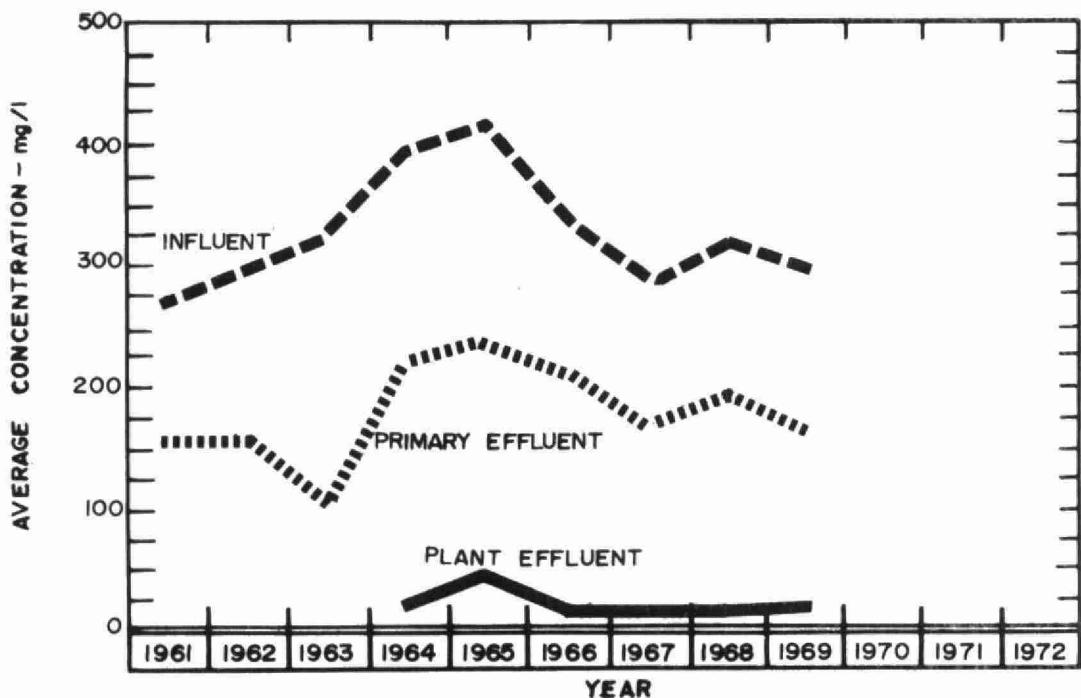


BIOCHEMICAL OXYGEN DEMAND





SUSPENDED SOLIDS

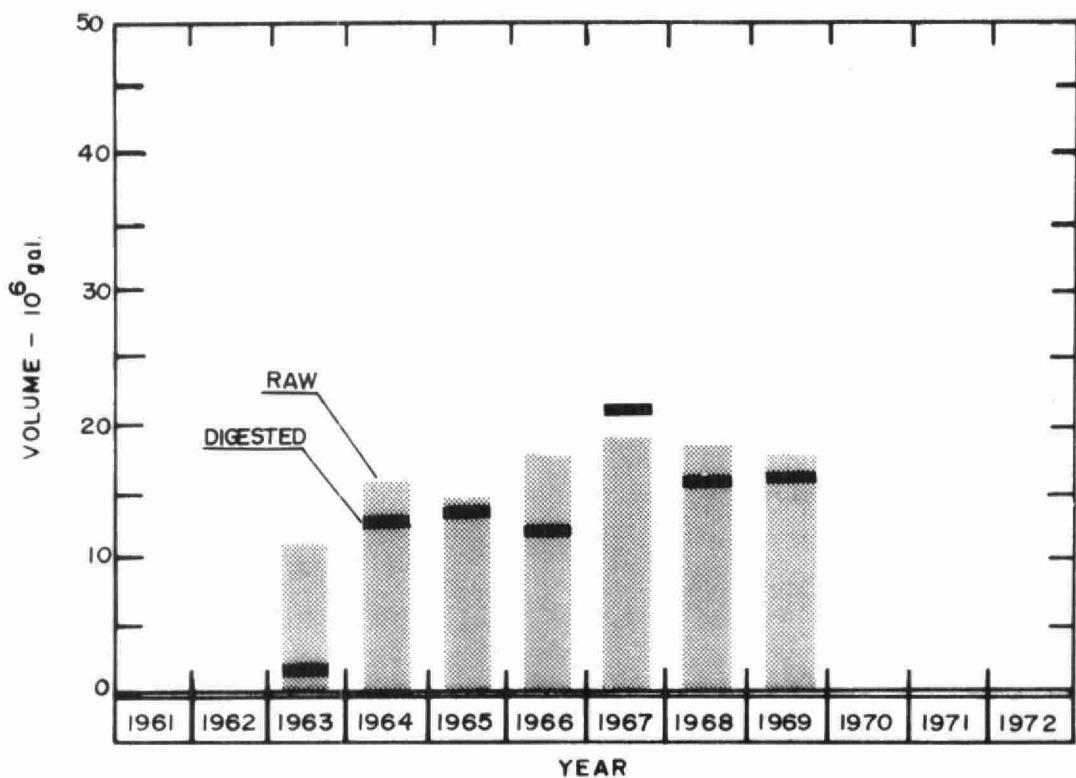


PLANT EFFICIENCY

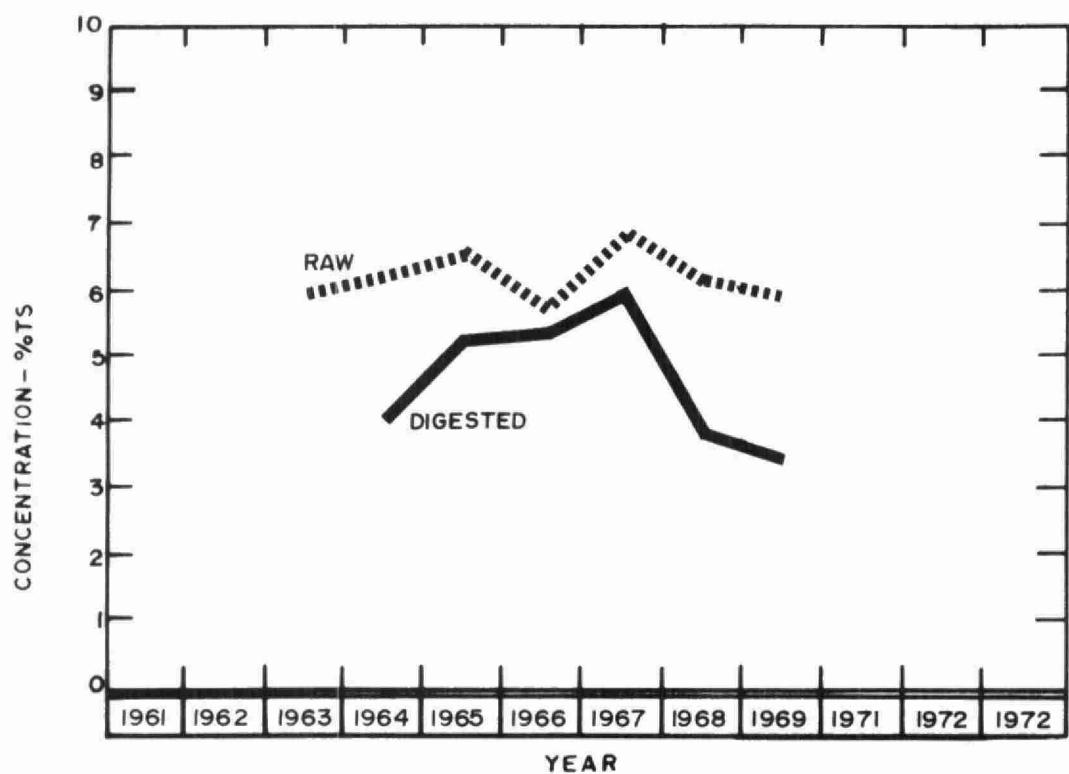
MONTH	BIOCHEMICAL OXYGEN DEMAND				SUSPENDED SOLIDS				GRIT REMOVAL cu ft	
	INF. mg/l	EFF. mg/l	REDUCTION		INF. CONCN mg/l	EFF. CONCN mg/l	REDUCTION			
			%	10^5 pounds			%	10^5 pounds		
JAN	321	12	96	10.1	344	17	95	10.7	1407	
FEB	305	23	92	9.1	370	33	91	10.9	847	
MAR	354	25	93	11.2	345	24	93	11.0	509	
APR	238	15	94	8.3	249	24	90	8.4	476	
MAY	256	16	94	9.0	251	11	96	9.0	432	
JUNE	240	14	94	7.4	313	11	96	9.9	455	
JULY	166	23	86	4.6	285	16	94	8.6	546	
AUG	177	17	90	4.6	291	8	97	8.2	454	
SEPT	218	30	86	5.4	240	8	97	6.6	343	
OCT	236	22	91	6.2	281	11	96	7.8	399	
NOV	270	17	94	8.4	284	11	96	9.0	301	
DEC	263	19	93	7.5	260	17	93	7.4	287	
TOTAL	-	-	-	-	-	-	-	-	6456	
AVERAGE	254	20	92	7.7	293	16	94	9.0	538	

AERATION

MONTH	AVG DAILY FLOW mil gal	AERATION INF.		SECONDY. EFF.		MLSS CONCNR mg/l	F/M lb BOD lb MLSS	AIR USED 1000 cu ft lb BOD	WASTE SLUDGE 10 ⁶ pounds
		BOD mg/l	SS CONCN mg/l	BOD mg/l	SS CONCN mg/l				
JAN	10.5	260	217	12	17	2430	.28	-	.289
FEB	11.5	224	190	23	33	2480	.26	-	.302
MAR	11.0	279	219	25	24	2440	.31	-	.356
APR	12.4	183	160	15	24	2610	.22	-	.768
MAY	12.1	169	155	16	11	2630	.20	-	.208
JUNE	10.9	177	165	14	11	2670	.18	-	.224
JULY	10.3	94	149	23	16	2410	.10	-	.125
AUG	9.3	95	135	17	8	2370	.09	-	.065
SEPT	9.5	145	134	30	8	2400	.14	-	.129
OCT	9.2	176	135	22	11	2880	.14	-	.128
NOV	11.0	202	133	17	11	2830	.20	-	.123
DEC	9.9	185	131	19	17	2670	.16	-	.124
TOTAL	-	-	-	-	-	-	-	-	-
AVERAGE	10.7	182	160	20	16	2560	.19	-	.237

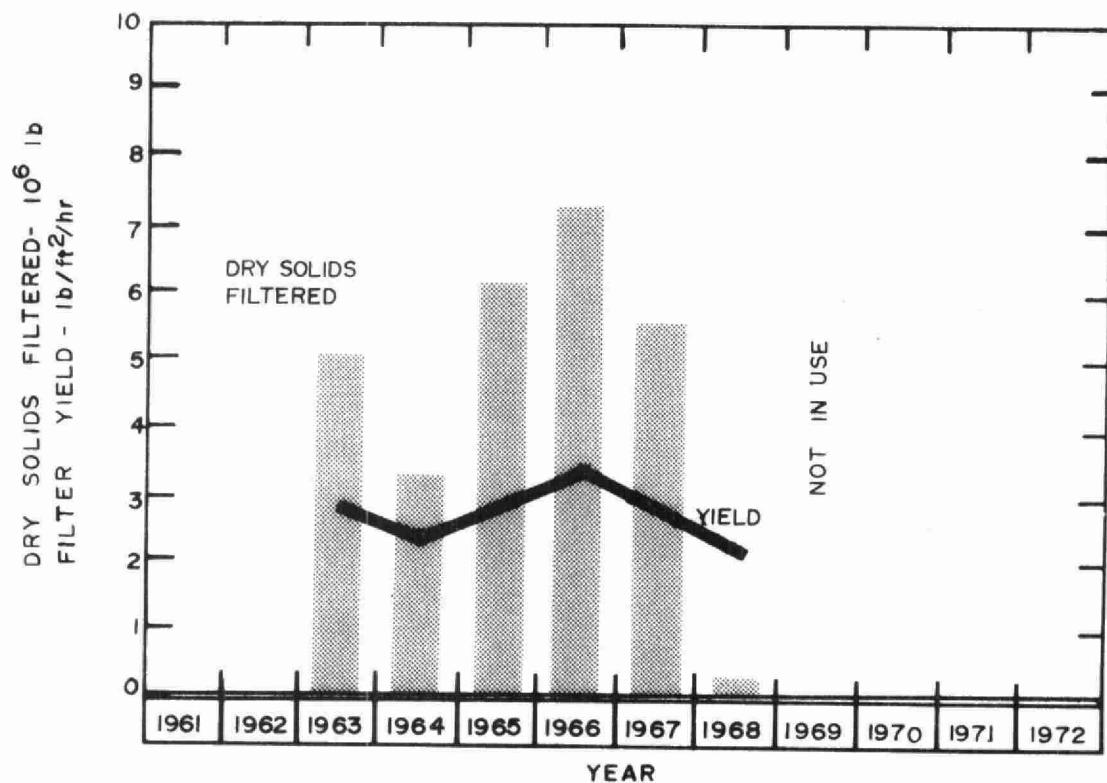


DIGESTION

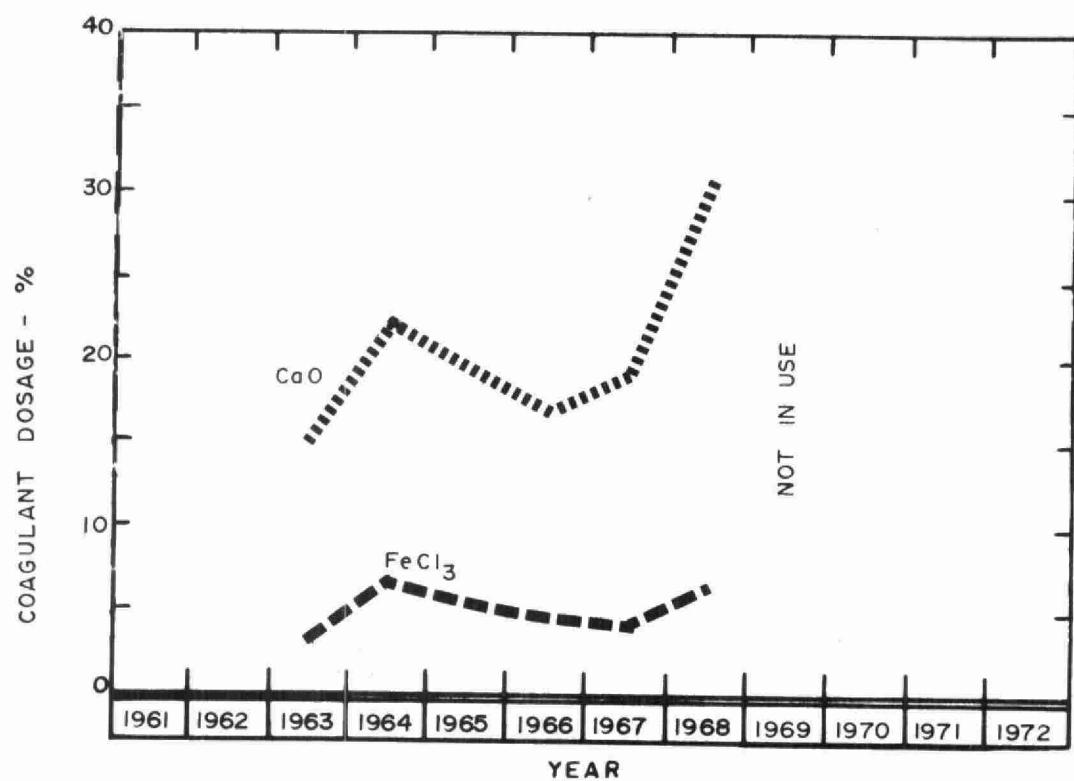


SLUDGE DIGESTION and DISPOSAL

MONTH	RAW SLUDGE			DIGESTED SLUDGE			SUPERNATANT		SLUDGE DISPOSAL	
	VOLUME 10^6 gal	TOTAL SOLIDS %	VOL SOLIDS %	VOLUME 10^6 gal	TOTAL SOLIDS %	VOL SOLIDS %	VOLUME 10^6 gal	TOTAL SOLIDS %	DEWATERED	LIQUID
									cu yd	cu yd
JAN	1.79	6.1	72	.74	3.6	58	.88	-	0	4399
FEB	1.34	7.3	72	1.47	4.0	55	.16	-	0	8707
MAR	1.72	6.6	74	1.48	4.0	59	0	-	0	8667
APR	1.52	6.5	71	1.58	3.7	57	0	-	0	5404
MAY	1.59	6.0	70	1.56	3.7	53	0	-	0	8090
JUNE	1.49	6.2	72	1.87	4.0	56	0	-	0	3223
JULY	1.32	6.2	65	.25	3.5	56	0	-	0	3661
AUG	1.43	6.5	63	1.17	4.0	52	0	-	0	4788
SEPT	1.55	5.2	71	2.19	3.9	52	0	-	0	2269
OCT	1.76	5.0	71	1.81	3.9	55	0	-	0	1315
NOV	1.70	5.5	69	1.64	2.8	58	0	-	0	2026
DEC	1.64	5.1	72	1.00	3.2	58	0	-	0	3199
TOTAL	18.85	-	-	16.76	-	-	1.04	-	0	55748
AVERAGE	1.57	6.0	70	1.40	3.6	55	0	-	0	4646



VACUUM FILTRATION



LABORATORY LIBRARY



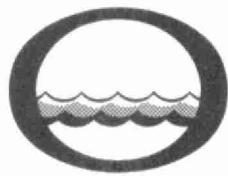
96936000118737

TD/227/K57/W38/1969/MOE
Ontario Water Resources Co
Kitchener water
pollution control plant: at the
1969 operating c.1 a aa
summary

Environment Ontario



Laboratory Library
125 Resources
Etobicoke, Ontario M9P 3V6
Canada



Water management in Ontario